

CHAPTER 18

# Urinary Tract Infection in Women

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# Urinary Tract Infection in Women

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## INTRODUCTION

Urinary tract infection is an extremely common condition that occurs in both males and females of all ages. The prevalence and incidence of urinary tract infection is higher in women than in men, which is likely the result of several clinical factors including anatomic differences, hormonal effects, and behavior patterns.

## DEFINITION AND DIAGNOSIS

Urinary tract infection (UTI) is caused by pathogenic invasion of the urinary tract, which leads to an inflammatory response of the urothelium. Infections may be acute or chronic. The clinical manifestations of UTI depend on the portion of the urinary tract involved, the etiologic organism(s), the severity of the infection, and the patient's ability to mount an immune response to it. Signs and symptoms may include fever, chills, dysuria, urinary urgency, frequency, and cloudy or malodorous urine.

*Bacteriuria* refers to the presence of bacteria in the urine, but this is not equivalent to UTI. A UTI includes the inflammatory response and the associated signs and symptoms that result from the presence of the bacteria. Bacteriuria may be asymptomatic, particularly in elderly adults. *Pyuria* refers to the presence of white blood cells in the urine. It is a marker of inflammation in response to bacterial infection.

Infections in the urinary system are often classified by the anatomic site or organ involved, although the entire urinary tract may be affected. *Pyelonephritis*

refers to a urinary tract infection involving the kidney. This may be an acute or chronic process. Acute pyelonephritis is characterized by fever, chills, and flank pain. Patients may also experience nausea and vomiting, depending on the severity of the infection and whether there is any obstruction to the flow of urine out of the renal collecting system. The risk of renal damage in most patients with uncomplicated UTI is low, even in those with uncomplicated acute pyelonephritis. Chronic pyelonephritis implies recurrent renal infections and may be associated with the development of renal scarring and impaired function if obstruction is present. A perinephric abscess may develop in severe cases of pyelonephritis. The clinical distinction between upper and lower UTI may be difficult, particularly in women.

*Cystitis* is an inflammatory process of the urinary bladder, typically caused by bacterial infection. It may be acute or chronic in nature. *Urethritis* refers to an inflammation or infection of the urethra. This often occurs in combination with cystitis and may be difficult to differentiate. Isolated bacterial urethritis is rare in women. Vaginitis and cervicitis, often related to sexually transmitted organisms, may also cause symptoms attributed to cystitis or urethritis.

Recurrent UTIs involve reinfection from a source outside the urinary tract or from bacterial persistence within it. In each case, the infections may be caused by the same or different organisms. The vast majority of recurrent UTIs in women are due to reinfection.

The standard ICD-9 diagnostic codes for UTI (Table 1) were used for the analyses presented in this chapter. These codes are categorized primarily on the

**Table 1. Codes used in the diagnosis and management of female urinary tract infection**

*Females 18 years or older with one of the following ICD-9 diagnosis codes:*

**Cystitis**

112.2	Candidiasis of other urogenital sites
120.9	Schistosomiasis, unspecified
595.0	Acute cystitis
595.1	Chronic interstitial cystitis
595.2	Other chronic cystitis
595.3	Trigonitis
595.89	Other specified types of cystitis
595.9	Cystitis, unspecified
646.6	Infections of genitourinary tract in pregnancy
760.1	Maternal renal and urinary tract diseases affecting fetus or newborn

**Pyelonephritis**

590.0	Chronic pyelonephritis
590.00	Chronic pyelonephritis without lesion of renal medullary necrosis
590.01	Chronic pyelonephritis with lesion of renal medullary necrosis
590.1	Acute pyelonephritis
590.10	Acute pyelonephritis without lesion of medullary necrosis
590.11	Acute pyelonephritis with lesion of renal medullary necrosis
590.2	Renal and perinephric abscess
590.3	Pyeloureteritis cystica
590.8	Other pyelonephritis or pyonephrosis, not specified as acute or chronic
590.9	Infection of kidney, unspecified
593.89	Other specified disorders of kidney and ureter

**Other**

597.89	Other urethritis
599.0	Urinary tract infection site not specified
646.5	Asymptomatic bacteriuria in pregnancy

basis of the site and type of infection involved. The primary categories include cystitis, pyelonephritis, and other infections. Common definitions are used here to permit comparisons among datasets.

The diagnosis of UTI may be made presumptively on the basis of clinical signs and symptoms in combination with urinalysis results. A urinalysis that reveals both bacteriuria and pyuria is considered clinically diagnostic of UTI. Traditionally, confirmatory cultures have been obtained to verify the infection and identify the specific organism(s) involved; however, this standard is evolving. If a culture is obtained, the presence of at least  $10^5$  colony-forming units (CFU) of bacteria on a voided specimen has classically been used as the culture-based definition of UTI. Lower colony counts (100 CFU) may be used to establish a clinical diagnosis in catheterized or aspirated specimens from symptomatic patients. Bacterial colonization of indwelling catheters is common, and it may be difficult to distinguish between this phenomenon and symptomatic UTI requiring therapy. Drug susceptibility data are typically obtained to verify that appropriate therapy has been selected. The increased prevalence of drug-resistant bacteria has made susceptibility testing particularly important.

## RISK FACTORS

Research has identified a number of risk factors for UTI in women. Women are at greater risk for UTI than men, partly because of the relatively short, straight anatomy of the urethra. Retrograde ascent of bacteria from the perineum is the most common cause of acute cystitis in women. Host factors such as changes in normal vaginal flora may also affect the risk of UTI. Genetic factors, including expression of HLA-A3 and Lewis blood group Le(a-b-) or Le(a+b-), may also put women at higher risk for recurrent UTI. Sexually active women are at greater risk for UTI than women who do not engage in sexual intercourse. Simple hygiene habits, including voiding before and after sexual intercourse and wiping from anterior to posterior, are often advocated to decrease the risk of UTI; however, a recent review found no advantage to these behavioral techniques (1). Contraceptive use may affect the rate of UTI, which appears to be greater in women who use certain types of spermicides.

Hematogenous and lymphatic spread of bacteria to the urinary tract is uncommon in healthy patients.

Vesicoureteral reflux has been identified as a risk factor for the development of pyelonephritis. This is most commonly diagnosed in children, but it may also be identified in adults. Patients with recurrent pyelonephritis warrant anatomic evaluation, usually with a voiding cystourethrogram to identify evidence of reflux.

A foreign body in the urinary system may act as a nidus for infection and may be associated with recurrent infections. Common examples include urinary calculi and indwelling catheters. Indwelling urinary catheters are associated with chronic bacterial colonization, which occurs in almost all patients after five to seven days. This colonization significantly increases the risk for symptomatic UTI. Catheter modifications with antibiotic and silver impregnation have been developed in an effort to decrease the rate of infection in patients with indwelling catheters (2). Urea-splitting organisms are often associated with UTI in the presence of stones.

Post-menopausal women are at higher risk for UTI than younger women are, because they lack estrogen, which is essential to maintain the normal acidity of vaginal fluid. This acidity is critical to permit the growth of *Lactobacillus* in the normal vaginal flora, which acts as a natural host defense mechanism against symptomatic UTI. Restoration of the normal hormonal milieu in the vagina is not effective treatment for active urinary tract infections, but it may be useful for prevention. Other urologic factors potentially associated with an increased risk of UTI in post-menopausal women include urinary incontinence, cystocele, and elevated volumes of post-void residual urine.

Urinary tract infections are often characterized as *uncomplicated* if they involve only the bladder and are not associated with the presence of foreign bodies or anatomic abnormalities. *Complicated* UTIs may include pyelonephritis, urosepsis and the presence of foreign bodies or anatomic disorders. Significant UTIs in elderly patients are often classified as *complicated* due to the increased risk of associated morbidity and mortality in this population.

Urinary tract infections may be caused by a variety of different organisms, most commonly bacteria. The most frequent bacterial cause of UTI in adult women

is *Escherichia coli*, which is part of the normal gut flora. This organism accounts for approximately 85% of community-acquired UTIs and 50% of hospital-acquired UTIs. Other common organisms include *Enterococcus faecalis*, *Klebsiella pneumoniae*, and *Staphylococcus saprophyticus*. Nosocomial infections and those associated with foreign bodies may involve more aggressive organisms such as *Pseudomonas aeruginosa*, *Serratia*, *Enterobacter*, and *Citrobacter species*.

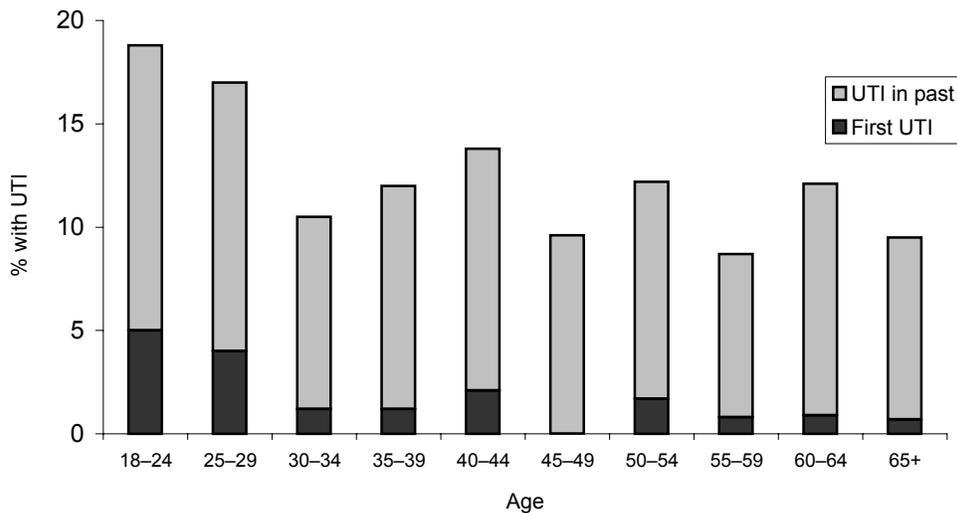
Nonbacterial infections are less common and tend to occur more often in immunosuppressed individuals or those with diabetes mellitus. Fungal infections with *Candida spp* are the most common nonbacterial infections. Other less common urinary tract pathogens include *Mycobacterium tuberculosis* and a variety of anaerobic organisms. The overall role of anaerobic urinary infections is controversial; however, anaerobes may be especially dangerous in immunocompromised patients due to an increased risk of severe infections such as emphysematous pyelonephritis or cystitis. Bilharzial cystitis is uncommon in the United States but may be seen in

patients who have recently immigrated or traveled to areas of the world where schistosomes are endemic.

Research on the physiology and microbiology of urinary tract infections has identified a number of organism and host factors that may increase the risk for UTI. Disruption of the urothelium due to trauma or other irritation may increase the ability of organisms to adhere to tissue and cause infection. Bacteria may develop a number of mechanisms such as pili, fimbriae, and chemical adhesins that increase their ability to adhere to host tissues.

**PREVALENCE AND INCIDENCE**

Urinary tract infection is an extremely common diagnosis in women, and treatment incurs substantial costs. It is estimated that at least one-third of all women in the United States are diagnosed with a UTI by the time they reach 24 years of age (3). In a random-digit-dialing telephone survey of 2,000 women, Foxman and colleagues found that 10.8% of women 18 years of age or older self-reported at least one UTI in the previous 12 months (95% CI, 9.4–12.1) (Figure



**Figure 1. Self-reported incidence of physician-diagnosed urinary tract infection during the previous 12 months by age and history of urinary tract infection among 2000 United States women participating in a random digit dialing survey. The average standard error for the total incidences in each of the age groups is 2.3%.**

SOURCE: Adapted from Annals of Epidemiology, 10, Foxman B, Barlow R, D’Arcy H, Gillespie B, and Sobel JD, Urinary tract infection: self-reported incidence and associated costs, 509–515, Copyright 2000, with permission from Elsevier Science.

**Table 2. Female lifetime prevalence of urinary tract infections, by sociodemographic group, count, rate<sup>a</sup>**

	Incidence	
	Count	Rate
Total count <sup>b</sup>	50,810,018	53,067
1–2 bladder infections ever	26,871,194	28,065
3+ bladder infections ever	23,938,824	25,002
Mean number of infections in the last 12 months of those ever having UTI	0.40	...
Race/ethnicity		
White non-Hispanic	41,641,569	55,937
Black non-Hispanic	5,129,383	45,976
Hispanic	3,195,829	45,550
Other	843,238	26,937
Region		
Midwest	12,081,920	52,335
Northeast	9,508,670	47,039
South	18,116,413	54,924
West	11,103,015	57,048
Urban/rural		
MSA	24,236,785	34,135
Non-MSA	26,573,233	107,393

MSA, metropolitan statistical area.

<sup>a</sup>Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

<sup>b</sup>The data in this table are based on the weighted number of persons who responded “1 or more” to question HAK4: “How many times have you had a bladder infection, also called urinary tract infection, UTI or cystitis?”

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988–1994.

**Table 3. Female incidence of UTIs in past 12 months, by sociodemographic group, count, rate<sup>a</sup>**

	Incidence	
	Count	Rate
Total count <sup>b</sup>	12,753,035	13,320
1 or more bladder infections in the last 12 months	12,753,035	13,320
Mean number of infections in the last 12 months	1.7	...
Age		
18–24	2,741,548	21,732
25–34	3,274,713	15,196
35–44	2,338,316	11,925
45–54	1,531,348	11,550
55–64	1,129,215	10,105
65–74	930,627	9,225
75–84	619,903	10,577
85+	187,365	11,770
Race/ethnicity		
White non-Hispanic	9,949,997	13,366
Black non-Hispanic	1,572,606	14,096
Hispanic	1,017,401	14,501
Other	213,032	6,805
Region		
Midwest	2,518,030	10,907
Northeast	2,346,347	11,607
South	5,037,597	15,273
West	2,851,061	14,649
Urban/rural		
MSA	6,425,838	9,050
Non-MSA	6,327,198	25,571

...data not available.

MSA, metropolitan statistical area.

<sup>a</sup>Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

<sup>b</sup>The data in this table are based on the weighted number of persons who responded “1 or more” to question HAK5: “How many of these infections did you have during the past 12 months?”

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988–1994.

**Table 4. Frequency of urinary tract infection (including cystitis, pyelonephritis, orchitis, and other) as a diagnosis in VA patients seeking outpatient care, rate<sup>a</sup>**

Sub-Conditions	1999		2000		2001	
	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Male UTI <sup>b</sup>	2,082	2,705	1,963	2,591	1,719	2,334
Cystitis	136	177	131	175	111	161
Pyelonephritis	48	65	41	57	40	60
Orchitis	314	378	297	360	99	334
Other	1,649	2,187	1,555	2,097	1,351	1,868
Female UTI <sup>b</sup>	4,793	6,015	4,589	5,904	4,265	5,552
Cystitis	512	670	517	684	469	626
Pyelonephritis	72	81	55	71	64	78
Other	4,378	5,521	4,187	5,409	3,883	5,075

<sup>a</sup>Rate is defined as the number of unique patients with each condition (unweighted frequency or # of cases) divided by the base population in the same fiscal year (# unique SSNs per strata) x 100,000 to calculate the rate per 100,000 (# cases per 100,000 unique outpatients).

<sup>b</sup>Represents unique cases of UTI (i.e., patients with more than one UTI subtype are counted only once).

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, 1999–2001.

1). Using this information, the authors calculated the lifetime risk for UTI in their sample to be 60.4% (95% CI, 55.1–65.8). Using these data, the authors estimated that at least 11.3 million women in the United States had at least one UTI in 1995, and the overall cost of prescriptions to treat UTIs that year was more than \$218 million.

Similarly, between 1988 and 1994, the overall lifetime prevalence of UTI was estimated to be 53,067 cases per 100,000 adult women, based on the National Health and Nutrition Examination Survey (NHANES-III) (Table 2). The prevalence in women was significantly higher than that estimated in men (13,689 cases per 100,000) in this study (Chapter 7, Table 2). Data from NHANES-III also shows the incidence of UTI in the past 12 months to be 13,320 per 100,000 adult women (Table 3).

Data from US Veterans Health Administration (VA) facilities revealed a similar disparity in the numbers of women and men seeking care for UTIs (Table 4). In 2001, the rate of women seeking outpatient care for cystitis was 626 cases per 100,000 (with 469 as the primary diagnosis), compared with 161 cases per 100,000 (111 as the primary diagnosis) in men. In contrast to cystitis, the overall prevalence of women seeking outpatient care for pyelonephritis was only slightly higher in women than in men: 78 cases per 100,000 (64 as the primary diagnosis) vs 60

cases per 100,000 (40 as the primary diagnosis). In the three years for which data are available (1999 to 2001), the overall frequency of an outpatient primary diagnosis of UTI in US female VA outpatient clinic patients gradually declined, from 4,793 per 100,000 to 4,265 per 100,000 (Table 5). Also, note that the prevalence rates in the VA data are much lower than those in NHANES because the VA identifies only UTIs for which patients sought medical attention in one year, whereas NHANES relies on self-reported UTI over a lifetime and hence presents a true population prevalence.

## MORBIDITY AND MORTALITY

Urinary tract infections may be associated with significant morbidity and even mortality. This is particularly true in the frail elderly and in those with associated urinary incontinence, where UTI may be related to skin breakdown and ulceration. Complicated UTIs may lead to urosepsis and death; however, the risk of UTI-related mortality in the elderly and comorbid population is unknown. It is generally believed that asymptomatic bacteriuria in elderly patients does not need to be treated, although this issue is controversial (4). More commonly, UTI is associated with bothersome urinary symptoms that

Table 5. Frequency of urinary tract infection<sup>a</sup> as a diagnosis in female VA patients seeking outpatient care, rate<sup>b</sup>

	1999		2000		2001	
	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Total	4,793	6,015	4,589	5,904	4,265	5,552
Age						
18–25	4,396	5,154	4,852	5,878	4,431	5,325
25–34	4,969	5,840	4,726	5,705	5,051	6,063
35–44	4,547	5,634	4,370	5,525	3,909	5,087
45–54	4,624	5,841	4,451	5,717	4,127	5,366
55–64	4,543	6,081	4,645	6,320	4,273	5,729
65–74	5,097	6,843	4,887	6,677	4,040	5,681
75–84	5,546	7,395	4,818	6,598	4,229	5,979
85+	5,484	6,567	5,269	7,446	5,088	6,416
Race/ethnicity						
White	6,094	7,697	5,764	7,484	5,322	6,937
Black	5,735	7,182	5,280	6,664	4,942	6,403
Hispanic	6,672	8,556	5,801	7,605	5,666	6,922
Other	4,787	6,080	6,722	7,665	3,630	13,299
Unknown	3,255	4,038	3,209	4,111	3,048	3,976
Region						
Eastern	4,008	4,965	3,781	4,823	3,623	4,591
Central	4,640	5,871	4,696	5,939	4,195	5,456
Southern	5,313	6,747	4,888	6,489	4,482	6,002
Western	4,778	5,887	4,720	5,865	4,512	5,707
Insurance status						
No insurance/self-pay	4,792	5,957	4,658	5,928	4,375	5,576
Medicare/Medicare supplemental	6,064	7,828	5,308	7,192	4,791	6,692
Medicaid	5,229	6,536	5,482	6,360	5,915	6,839
Private insurance/HMO/PPO	4,001	5,146	3,829	4,914	3,428	4,559
Other insurance	4,174	4,973	3,697	4,736	3,512	4,484
Unknown	5,594	6,993	1,493	1,493	1,914	1,914

HMO, health maintenance organization; PPO, preferred provider organization.

<sup>a</sup>Represents diagnosis codes for female urinary tract infections (including cystitis, pyelonephritis, and other UTIs).

<sup>b</sup>Rate is defined as the number of unique patients with each condition (unweighted frequency or # of cases) divided by the base population in the same fiscal year (# unique SSNs per strata) x 100,000 to calculate the rate per 100,000 (# cases per 100,000 unique outpatients).

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, 1999–2001.

**Table 6. Prescribing trends from 1989 through 1998<sup>a</sup>**

Antibiotic Prescribed	1989–1990	1991–1992	1993–1994	1995–1996	1997–1998	Adjusted Odds Ratio (95% Confidence Interval) for Predictor, Year (per decade) <sup>b</sup>
Trimethoprim-sulfamethoxazole	48	35	30	45	24	0.32 (0.20–0.51)
Recommended fluoroquinolones <sup>c</sup>	19	16	33	24	29	2.12 (1.26–3.56)
Nitrofurantoin	14	25	24	20	30	2.55 (1.50–4.31)
Overall non-recommended antibiotics <sup>d</sup>	33	49	36	32	46	1.57 (1.00–2.44)
No. of visits per 2-year period	208	178	181	192	227	n/a

<sup>a</sup>Unless otherwise indicated, data are percentages of patients.

<sup>b</sup>In all models, antibiotic prescribing was the dependent variable. All trends adjusted for age younger than 45 years and history of urinary tract infection.

<sup>c</sup>Recommended fluoroquinolones were defined as ciprofloxacin, ofloxacin, lomefloxacin, enoxacin, and fleroxacin.

<sup>d</sup>Non-recommended antibiotics were defined as all antibiotics other than trimethoprim or trimethoprim-sulfamethoxazole or recommended fluoroquinolones.

SOURCE: Reprinted from Huang ES, Stafford RS, National patterns in the treatment of urinary tract infections in women by ambulatory care physicians, *Archives Internal Medicine*, 162, 41–47, Copyright © 2002, with permission from the American Medical Association. All rights reserved.

can lead to work absence and decreased ability to engage in activities of daily living.

## TRENDS IN HEALTHCARE RESOURCE UTILIZATION

### Medications

Antimicrobial therapy remains the mainstay of treatment for patients with UTIs. Bacterial urine cultures with appropriate drug susceptibility data should guide the selection of antimicrobials. However, most symptomatic patients require selection of therapy prior to the identification of the

etiologic organism. Initial therapy is usually empiric, with subsequent modifications made on the basis of urine culture and susceptibility results as necessary. The need for urine culture is also an area of debate. Many experts advocate empiric therapy for most patients, with urine cultures reserved for those who fail to respond to treatment or have recurrent infections. The Infectious Disease Society of America published guidelines in 1999 that recommended the use of trimethoprim-sulfamethoxazole (TMP-SMX) as first-line therapy for patients without an allergy to this compound (5). Specific fluoroquinolones were recommended as second-line agents. In geographic

**Table 7. Expenditures for female urinary tract infection and share of costs, by site of service (% of total)**

Site of Service	1994	1996	1998	2000
Total <sup>a</sup>	\$1,885,000,000	\$1,944,300,000	\$2,211,900,000	\$2,474,000,000
Inpatient	\$1,168,700,000 (62.0%)	\$1,254,100,000 (64.5%)	\$1,322,700,000 (59.8%)	\$1,360,700,000 (55.0%)
Physician Office	\$309,100,000 (16.4%)	\$295,500,000 (15.2%)	\$404,800,000 (18.3%)	\$536,800,000 (21.7%)
Hospital Outpatient	\$126,300,000 (6.7%)	\$105,000,000 (5.4%)	\$165,900,000 (7.5%)	\$163,300,000 (6.6%)
Emergency Room	\$280,900,000 (14.9%)	\$289,700,000 (14.9%)	\$318,500,000 (14.4%)	\$413,200,000 (16.7%)

<sup>a</sup>Total unadjusted expenditures exclude spending on outpatient prescription drugs for the treatment of urinary tract infection. Average drug spending for UTI-related conditions (both male and female) is estimated at \$96 million to \$146 million annually for the period 1996 to 1998.

SOURCES: National Ambulatory Medical Care Survey, National Hospital Ambulatory Medical Care Survey, Healthcare Cost and Utilization Project, and Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

**Table 8. Inpatient stays by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI)**

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total <sup>c</sup>	114,640	579 (575–582)	127,460	632 (628–635)	128,380	674 (670–677)
Total < 65	8,480	355 (347–363)	9,400	350 (343–357)	11,200	403 (396–411)
Total 65+	106,160	609 (606–613)	118,060	675 (671–679)	117,180	720 (716–724)
Age						
65–74	27,880	303 (300–307)	27,300	303 (300–307)	24,760	313 (309–317)
75–84	42,180	715 (708–722)	46,980	785 (778–792)	46,480	796 (788–803)
85–94	31,700	1,527 (1,510–1,544)	37,660	1,694 (1,677–1,711)	39,460	1,774 (1,756–1,791)
95+	4,400	1,706 (1,656–1,757)	6,120	2,161 (2,108–2,215)	6,480	2,088 (2,038–2,139)
Race/ethnicity						
White	94,780	565 (561–568)	105,120	606 (602–609)	104,420	645 (642–649)
Black	13,540	803 (790–816)	17,280	939 (925–953)	17,180	974 (959–988)
Asian	...	...	300	318 (282–354)	740	418 (388–448)
Hispanic	...	...	1,660	826 (786–866)	3,040	827 (798–857)
N. American Native	...	...	200	1,238 (1,064–1,411)	380	1,457 (1,311–1,603)
Region						
Midwest	28,800	574 (567–580)	31,040	602 (595–609)	31,040	629 (622–636)
Northeast	21,000	463 (457–470)	23,980	534 (527–540)	23,660	604 (596–612)
South	50,760	726 (720–733)	56,420	781 (774–787)	57,940	826 (819–832)
West	12,780	448 (440–456)	14,420	504 (495–512)	14,040	517 (508–525)

... data not available.

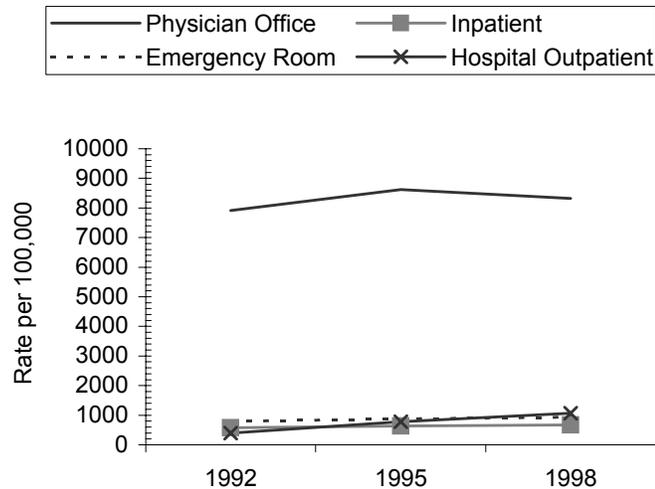
<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.



**Figure 2. Trends in visits by females with urinary tract infection listed as primary diagnosis, by site of service and year.**

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

areas where resistance to TMP-SMX is high (>20%), fluoroquinolones are recommended as first-line therapy.

The recommendation to use older agents such as TMP-SMX as initial therapy has strong merit. These medications cost less than newer antimicrobials such as fluoroquinolones. In addition, reserving fluoroquinolones and broad-spectrum antimicrobials for complicated infections or cases with documented resistance to first-line therapy may help reduce the incidence of bacterial resistance. However, a recent study on the national trends in prescribing patterns for UTI in women among ambulatory care physicians revealed that the use of TMP-SMX is decreasing and the use of fluoroquinolones is increasing (6). The proportion of TMP-SMX use dropped from 48% in 1989–1990 to 24% in 1997–1998 (adjusted OR, 0.33; 95% CI, 0.21–0.52 per decade). At the same time, fluoroquinolone use increased from 19% to 29% (adjusted OR, 2.28; 95% CI, 1.35–3.83 per decade) (Table 6). This indicates that there is a trend toward using more-expensive antimicrobials such as fluoroquinolones as initial therapy. This trend may be due in part to increased rates of outpatient care and increased availability and marketing of these products. However, it has the potential to increase both overall costs and antimicrobial resistance.

### Inpatient Care

Severe UTIs, particularly those associated with acute pyelonephritis, may require inpatient hospitalization for treatment with intravenous antimicrobials. In 2000, inpatient services constituted 55% of all expenditures for the treatment of UTI (Table 7). According to data from the Centers for Medicare and Medicaid Services (CMS), there was a gradual overall increase in the age-unadjusted rate of inpatient hospitalization for treatment of UTI in adult women between 1992 (579 per 100,000) and 1998 (674 per 100,000) (Table 8 and Figure 2). While the overall rate of inpatient stays for women 84 years of age and younger has remained relatively constant, there has been a dramatic increase in the rate of inpatient hospital stays for very elderly women. The rate for women 85 to 94 years of age increased from 1,527 per 100,000 in 1992 (95% CI, 1,510–1,544) to 1,774 per 100,000 in 1998 (95% CI, 1,756–1,791). The rate was even higher for women over 95, increasing from

1,706 per 100,000 in 1992 to 2,088 in 1998. Urinary tract infections may be more severe in frail elderly women due to additional comorbidity, and this may necessitate more aggressive treatment with inpatient hospitalization and intravenous antimicrobial therapy. African American women had higher rates of inpatient treatment than did other ethnic groups (1.1 to 2.95 times higher). Patients living in the South had higher rates of inpatient care than did women living in other regions.

Data from the Healthcare Cost and Utilization Project (HCUP) for the years from 1994 to 2000 indicate that the rate of inpatient hospitalization for a primary diagnosis of UTI has been generally decreasing for young and middle-aged women (18 to 54 years of age) and has been relatively stable overall for those aged 55 to 74 (Table 9). In addition, the overall rate of inpatient hospitalization is relatively low for young women, increasing approximately twofold when women reach the 65 to 74 age group. However, these data also demonstrate that there has been a gradual increase in the rate of inpatient hospitalizations for women 75 to 84 years of age when UTI is the primary admitting diagnosis. The most striking finding in the data is that women 85 and older had inpatient hospitalization rates 2.82 to 3.27 times higher than those of women in the 75 to 84 age range. This may be a reflection of the degree of associated morbidity and potential health impairment caused by UTI in elderly women. Nosocomial infections may also influence the rates of hospitalization in this patient group. It is unclear why estimated inpatient utilization rates are lower in HCUP data than in CMS data.

Acute pyelonephritis is a serious UTI often treated with intravenous antimicrobials, historically requiring inpatient care, although newer approaches include primary management with oral antimicrobials. Analysis of HCUP data for women admitted to the hospital for a primary diagnosis of pyelonephritis indicates that there was a gradual decline in the rate of admissions between 1994 and 2000 (Table 10). Pyelonephritis accounted for 28% of the female UTI hospitalizations in 1994 and 21% in 2000. The overall rate of admissions for pyelonephritis among women gradually declined from 65 per 100,000 (95% CI, 62–68) in 1994 to 49 per 100,000 (95% CI, 46–51) in 2000. This trend is reflected across essentially all age strata analyzed. It likely reflects increased use of oral

Table 9. Inpatient hospital stays by adult females with urinary tract infection (any anatomic location) listed as primary diagnosis, count, rate<sup>a</sup> (95% CI)

	1994			1996			1998			2000		
	Count	Rate	Rate									
Total <sup>b</sup>	223,256	232 (223–240)		235,055	234 (226–243)		243,584	238 (230–246)		245,879	235 (227–242)	
Age												
18–24	16,748	135 (126–144)		15,205	122 (114–130)		13,496	108 (101–115)		12,300	93 (87–99)	
25–34	21,873	106 (99–113)		20,183	98 (92–105)		17,495	88 (83–94)		15,629	82 (76–87)	
35–44	17,367	85 (80–90)		18,445	85 (80–89)		17,842	80 (75–84)		17,009	75 (71–79)	
45–54	14,592	99 (93–105)		15,324	94 (88–100)		15,630	90 (85–94)		16,633	89 (85–93)	
55–64	16,336	154 (145–163)		17,036	155 (146–164)		17,263	149 (142–156)		18,375	150 (144–157)	
65–74	33,529	339 (324–355)		34,216	340 (324–356)		36,552	370 (353–387)		34,686	356 (342–370)	
75–84	53,966	920 (881–960)		59,660	931 (892–970)		64,687	957 (922–992)		66,664	968 (935–1001)	
85+	48,844	2,593 (2,477–2,709)		54,984	2,844 (2,725–2,962)		60,618	3,162 (3,038–3,286)		64,584	3,078 (2,975–3,182)	
Race/ethnicity												
White	131,419	180 (172–187)		139,026	185 (177–193)		136,003	180 (173–187)		137,718	180 (174–187)	
Black	26,970	234 (214–253)		28,841	239 (221–258)		24,887	200 (187–213)		23,177	180 (169–191)	
Asian/Pacific Islander	1,856	68 (55–80)		1,914	56 (48–64)		2,423	64 (48–80)		3,351	83 (73–92)	
Hispanic	12,829	156 (140–172)		14,359	159 (135–183)		15,865	162 (142–183)		16,430	154 (138–170)	
Region												
Midwest	48,859	213 (197–228)		51,308	218 (204–233)		54,813	231 (215–247)		52,991	222 (209–236)	
Northeast	47,668	235 (217–253)		44,923	223 (205–242)		47,095	232 (216–249)		47,204	229 (213–244)	
South	92,109	281 (263–299)		98,838	277 (260–294)		101,638	280 (265–295)		103,304	278 (263–294)	
West	34,620	170 (155–186)		39,986	189 (173–206)		40,038	182 (168–196)		42,380	183 (170–195)	
MSA												
Rural	52,366	216 (200–232)		55,871	248 (230–265)		55,038	240 (225–255)		57,804	251 (236–265)	
Urban	170,356	236 (226–246)		178,730	230 (220–239)		187,699	237 (227–246)		187,848	230 (221–238)	

MSA, metropolitan statistical area.

<sup>a</sup>Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

<sup>b</sup>Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 10. Inpatient hospital stays by adult females with pyelonephritis listed as primary diagnosis, count, rate\* (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total <sup>b</sup>	62,223	65 (62-68)	61,949	62 (59-65)	54,933	54 (51-56)	50,881	49 (46-51)
Age								
18-24	12,008	97 (90-104)	11,075	89 (83-95)	9,607	77 (71-82)	8,645	65 (60-70)
25-34	14,709	72 (67-76)	13,483	66 (61-70)	11,131	56 (52-60)	9,613	50 (46-54)
35-44	9,765	48 (45-51)	10,267	47 (44-50)	9,364	42 (39-45)	8,664	38 (36-41)
45-54	6,656	45 (41-49)	7,075	44 (40-47)	6,339	36 (34-39)	6,380	34 (32-36)
55-64	5,045	48 (44-52)	5,328	48 (44-53)	4,686	40 (38-43)	4,870	40 (37-43)
65-74	6,420	65 (59-71)	6,348	63 (58-69)	5,694	58 (53-62)	5,220	54 (49-58)
75-84	5,078	87 (79-94)	5,661	88 (80-96)	5,433	80 (74-87)	4,999	73 (66-79)
85+	2,541	135 (118-151)	2,712	140 (124-157)	2,679	140 (123-156)	2,490	119 (106-132)
Race/ethnicity								
White	34,772	48 (45-51)	33,882	45 (43-47)	28,732	38 (36-40)	25,448	33 (32-35)
Black	7,718	67 (60-74)	7,792	65 (59-70)	5,493	44 (40-48)	4,712	37 (33-40)
Asian/Pacific Islander	754	28 (22-33)	636	19 (15-22)	824	22 (15-29)	918	23 (18-28)
Hispanic	4,711	57 (50-64)	5,374	60 (47-72)	5,151	53 (44-61)	5,206	49 (42-55)
Region								
Midwest	14,047	61 (56-66)	13,962	59 (54-65)	11,931	50 (46-55)	11,378	48 (44-52)
Northeast	11,335	56 (51-61)	10,185	51 (46-56)	9,490	47 (41-53)	8,246	40 (36-43)
South	24,287	74 (67-81)	24,009	67 (62-73)	21,362	59 (55-63)	19,969	54 (50-58)
West	12,554	62 (55-68)	13,793	65 (57-74)	12,150	55 (50-60)	11,288	49 (44-54)
MSA								
Rural	15,155	63 (56-70)	14,555	64 (58-71)	13,410	58 (54-63)	12,252	53 (49-57)
Urban	46,844	65 (62-68)	47,282	61 (57-64)	41,186	52 (49-55)	38,552	47 (45-50)

MSA, metropolitan statistical area.

\*Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

<sup>b</sup>Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

**Table 11. Trends in mean inpatient length of stay (days) for adult females hospitalized with urinary tract infection listed as primary diagnosis**

	Length of Stay			
	1994	1996	1998	2000
Total	6.2	5.3	4.9	4.9
Age				
18–24	3.4	3.0	3.0	2.8
25–34	3.9	3.3	3.2	3.2
35–44	4.4	3.9	3.7	3.5
45–54	5.0	4.4	4.4	4.1
55–64	6.1	5.0	4.8	4.8
65–74	6.5	5.6	5.2	5.1
75–84	7.3	6.0	5.6	5.4
85+	7.7	6.3	5.7	5.5
Race/ethnicity				
White	6.2	5.3	5.0	4.9
Black	6.9	5.9	5.6	5.7
Asian/Pacific Islander	5.1	4.9	4.6	5.3
Hispanic	5.9	4.7	4.9	4.4
Other	6.6	5.7	4.4	5.2
Region				
Midwest	5.5	4.8	4.8	4.4
Northeast	8.4	6.9	6.0	5.6
South	5.8	5.0	4.8	4.9
West	5.2	4.7	4.4	4.4
MSA				
Rural	5.5	4.8	4.3	4.4
Urban	6.4	5.4	5.1	5.0
Primary payor				
Medicare	7.1	6.0	5.5	5.4
Medicaid	5.7	4.8	4.6	4.4
Private insurance/HMO	4.2	3.8	3.7	3.6
Self-pay	4.6	3.8	3.5	3.3
No charge	*	3.7	3.7	4.5
Other	5.2	3.8	4.1	3.6

\*Figure does not meet standard for reliability or precision.  
MSA, metropolitan statistical area; HMO, health maintenance organization.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

antimicrobials and home-based intravenous therapy in the treatment of women with pyelonephritis. The decline in age-unadjusted rates of hospitalization for women with pyelonephritis was most noticeable in African American and Caucasian women. Rates were relatively stable in Hispanic and Asian women. Rates of hospitalization declined in all geographic areas, and no distinct regional differences were noted.

The overall length of hospital stay of women who require inpatient hospitalization for the management of UTI has decreased, consistent with the general trend toward decreased length of stay (LOS) for all conditions (Table 11). Nationwide HCUP data reveal that the mean LOS for women with UTI decreased from 6.2 days in 1994 to 4.9 days in 2000. This trend was seen across all age groups, although elderly women continued to have a somewhat greater LOS than younger women, probably due to the more-severe infections or associated comorbidity in older adults. The decrease in LOS was more pronounced for women who have Medicare or Medicaid as their primary insurer than it was for women with either private insurance or HMO coverage.

### Outpatient Care

Outpatient care for UTI is provided in a variety of settings, which are analyzed separately below.

#### *Hospital Outpatient Care*

The overall rate of hospital outpatient visits for women with UTI generally increased from 1994 to 2000, according to data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), both when UTI was listed as the primary diagnosis (Table 12) and when UTI was listed as one of any diagnoses at the time of visit (Table 13). The most striking increases were observed in young women 18 to 34 years of age. Overall rates of hospital outpatient visits by young women for any reason were 1.64 times greater in 2000 than they were in 1994. Race/ethnicity appears to play some role in the rate of outpatient visits for UTI: Hispanic and African American women had higher age-unadjusted visit rates where reliable estimates are available. Some regional fluctuations were noted, but no consistent trends were observed. Rates of outpatient hospital visits for female UTI have been generally stable in metropolitan statistical areas (MSAs), that is, urban settings, but have been

Table 12. Hospital outpatient visits by adult females with urinary tract infection listed as primary reason for visit, count, rate<sup>a</sup> (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total <sup>b</sup>	432,626	449 (339–559)	358,850	357 (247–468)	563,504	551 (440–661)	559,406	534 (414–653)
Age								
18–34	178,349	542 (327–757)	135,538	411 (233–590)	181,772	562 (384–741)	233,033	719 (485–952)
35–64	167,763	366 (236–497)	128,161	261 (168–355)	228,773	445 (297–593)	212,682	397 (243–550)
65+	*	*	*	517 (73–961)	152,959	824 (497–1,152)	113,691	607 (305–909)
Race/ethnicity								
White	279,795	382 (282–482)	250,135	333 (199–466)	420,367	556 (427–685)	445,892	584 (434–734)
Black	*	*	*	386 (123–649)	*	*	*	*
Hispanic	*	*	60,153	667 (294–1,041)	62,288	638 (269–1,006)	*	*
Region								
Midwest	181,728	791 (403–1,180)	*	*	*	*	194,503	816 (494–1,139)
Northeast	52,869	261 (153–369)	69,047	343 (192–495)	160,350	791 (488–1,094)	102,854	498 (244–752)
South	147,905	451 (310–592)	69,346	194 (122–267)	252,082	695 (484–906)	181,573	489 (309–669)
West	50,124	247 (120–373)	64,839	307 (135–479)	*	*	*	*
MSA								
MSA	318,193	441 (329–553)	293,441	377 (246–508)	372,958	470 (349–591)	309,400	379 (274–483)
Non-MSA	*	*	*	*	190,546	830 (568–1,092)	250,006	1,084 (690–1,479)

\*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

<sup>a</sup>Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

<sup>b</sup>Persons of other races are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

Table 13. Hospital outpatient visits by adult females with urinary tract infection listed as any reason for visit, count, rate<sup>a</sup> (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total <sup>b</sup>	568,202	590 (469–711)	566,676	565 (436–693)	784,752	767 (634–900)	816,459	779 (627–932)
Age								
18–34	216,162	656 (428–885)	215,041	653 (445–861)	296,592	917 (673–1,161)	349,866	1,079 (776–1,382)
35–64	233,678	510 (357–664)	213,031	434 (302–567)	281,648	548 (388–708)	282,465	527 (351–703)
65+	118,362	671 (359–984)	*	*	206,512	1,113 (714–1,512)	184,128	983 (537–1,428)
Race/ethnicity								
White	375,156	513 (396–629)	361,243	481 (332–629)	564,054	746 (591–901)	613,429	804 (622–985)
Black	75,811	658 (322–994)	92,769	769 (425–1,114)	92,170	740 (371–1,108)	110,994	861 (377–1,345)
Hispanic	*	*	103,775	1,151 (614–1,687)	115,176	1,179 (664–1,694)	85,076	797 (330–1,264)
Region								
Midwest	236,759	1,031 (610–1,452)	245,751	1,045 (571–1,520)	128,220	540 (301–778)	281,994	1,183 (787–1,580)
Northeast	80,917	399 (269–529)	133,440	664 (464–864)	233,853	1,154 (787–1,521)	177,027	858 (467–1,248)
South	195,507	596 (434–759)	104,439	293 (202–384)	313,752	864 (623–1,106)	238,542	643 (432–854)
West	55,019	271 (142–400)	83,046	393 (209–578)	108,927	495 (287–704)	118,896	513 (240–786)
MSA								
MSA	432,852	600 (471–728)	470,464	605 (454–756)	566,770	714 (563–865)	496,653	608 (456–759)
Non-MSA	135,350	560 (267–852)	*	*	217,982	950 (669–1,230)	319,806	1,387 (950–1,824)

\*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

<sup>a</sup>Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

<sup>b</sup>Persons of other races are included in the totals.

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

**Table 14. Outpatient hospital visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI)**

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total	78,180	395 (392–397)	157,420	780 (776–784)	204,360	1,072 (1,068–1,077)
Total < 65	8,960	375 (367–383)	21,980	818 (807–829)	28,620	1,030 (1,019–1,042)
Total 65+	69,220	397 (394–400)	135,440	774 (770–778)	175,740	1,080 (1075–1,085)
Age						
65–74	31,200	339 (336–343)	64,600	718 (712–723)	74,920	948 (941–955)
75–84	28,360	481 (475–486)	50,480	843 (836–851)	70,680	1,210 (1,201–1,219)
85–94	8,740	421 (412–430)	18,940	852 (840–864)	28,000	1,259 (1,244–1,273)
95+	920	357 (334–380)	1,420	501 (475–528)	2,140	690 (661–719)
Race/ethnicity						
White	60,120	358 (355–361)	126,480	729 (725–733)	169,320	1,047 (1,042–1,052)
Black	11,000	652 (640–665)	20,240	1,100 (1,085–1,115)	20,080	1,138 (1,123–1,154)
Asian	...	...	240	254 (222–286)	860	486 (454–518)
Hispanic	...	...	2,760	1,374 (1,323–1,424)	6,240	1,698 (1,656–1,740)
N. American Native	...	...	1,360	8,416 (7,989–8,843)	2,320	8,896 (8,551–9,241)
Region						
Midwest	23,000	458 (452–464)	42,500	824 (816–832)	59,980	1,216 (1,206–1,226)
Northeast	15,080	333 (327–338)	20,280	451 (445–457)	25,660	655 (647–663)
South	27,440	393 (388–397)	72,820	1,008 (1,001–1,015)	90,520	1,290 (1,282–1,298)
West	11,960	419 (412–427)	21,020	734 (724–744)	27,640	1,017 (1,005–1,029)

... data not available.

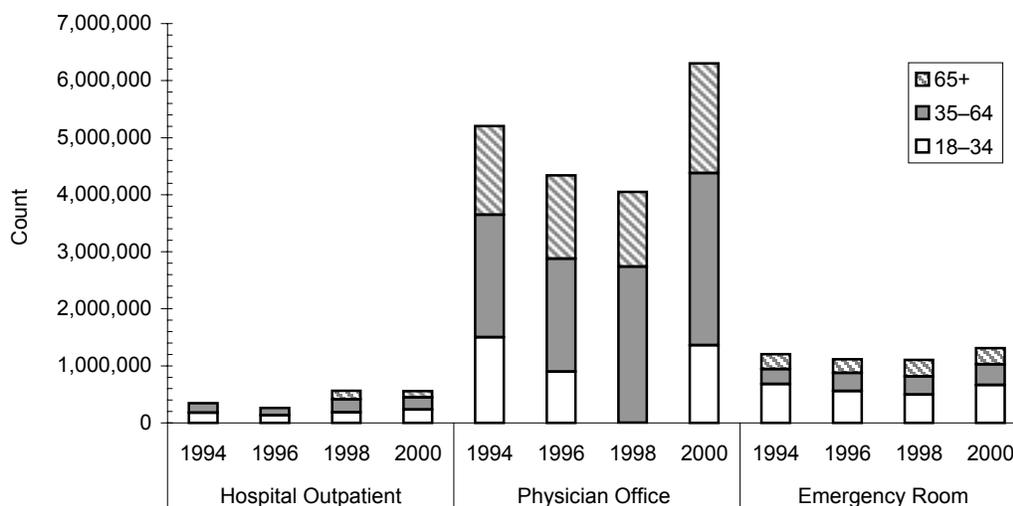
<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.



**Figure 3. Trends in visits by females for urinary tract infection by patient age and site of service.**

SOURCE: National Hospital Ambulatory Medical Care Survey (hospital outpatient and emergency room); National Ambulatory Medical Care Survey (physician office).

**Table 15. Physician office visits by adult females with urinary tract infection listed as primary reason for visit, count, rate<sup>a</sup> (95% CI)**

	Count		Rate		Count	Rate	
	1992		1994			1996	
Total	5,665,211	5,867 (4,766–6,968)	5,205,024	5,403 (4,513–6,292)	4,340,795	4,324 (3,493–5,156)	
Age							
18–34	2,167,103	6,431 (4,314–8,549)	1,502,309	4,562 (3,255–5,869)	895,243	2,718 (1,749–3,687)	
35–64	2,171,942	4,819 (3,391–6,248)	2,147,659	4,691 (3,413–5,969)	1,983,960	4,045 (2,874–5,217)	
65+	1,326,166	7,454 (4,906–10,001)	1,555,056	8,819 (6,236–11,403)	1,461,592	7,943 (5,146–10,741)	
Region							
Midwest	1,200,957	5,206 (3,157–7,255)	841,952	3,667 (2,385–4,948)	1,013,390	4,310 (2,460–6,159)	
Northeast	864,968	4,280 (2,362–6,199)	981,042	4,838 (2,927–6,750)	769,391	3,827 (2,271–5,383)	
South	2,437,343	7,295 (5,264–9,326)	2,042,634	6,231 (4,656–7,806)	1,386,711	3,889 (2,626–5,152)	
West	1,161,943	5,848 (3,112–8,584)	1,339,396	6,590 (4,227–8,953)	1,171,303	5,550 (3,392–7,707)	
MSA							
MSA	3,985,675	5,535 (4,377–6,694)	4,447,400	6,164 (5,074–7,253)	3,340,574	4,293 (3,351–5,235)	
Non-MSA	1,679,536	6,841 (4,157–9,525)	*	*	1,000,221	4,432 (2,662–6,202)	
Specialty							
Urology	1,103,291	1,143 (929–1,356)	731,871	760 (617–902)	780,023	777 (588–966)	
GFP	2,357,447	2,441 (1,599–3,284)	2,277,566	2,364 (1,702–3,026)	1,861,398	1,854 (1,261–2,447)	
All others	2,204,473	2,283 (1,623–2,943)	2,195,587	2,279 (1,711–2,847)	1,699,374	1,693 (1,151–2,234)	
		<b>1998</b>		<b>2000</b>			
Total	5,288,958	5,169 (4,050–6,288)	6,300,754	6,013 (4,840–7,186)			
Age							
18–34	*	*	1,361,644	4,200 (2,479–5,921)			
35–64	2,738,069	5,325 (3,672–6,978)	3,015,698	5,624 (4,046–7,201)			
65+	1,313,974	7,081 (4,056–10,105)	1,923,412	10,265 (6,551–13,979)			
Region							
Midwest	*	*	1,377,591	5,781 (3,377–8,186)			
Northeast	*	*	1,344,803	6,514 (3,837–9,192)			
South	2,158,702	5,948 (4,030–7,865)	1,963,660	5,290 (3,449–7,131)			
West	*	*	1,614,700	6,963 (4,202–9,724)			
MSA							
MSA	3,879,002	4,888 (3,640–6,136)	4,630,497	5,666 (4,388–6,944)			
Non-MSA	1,409,956	6,143 (3,642–8,645)	1,670,257	7,245 (4,437–10,053)			
Specialty							
Urology	547,954	536 (363–708)	783,389	748 (553–942)			
GFP	2,388,058	2,334 (1,569–3,099)	2,821,067	2,692 (1,815–3,569)			
All others	2,352,946	2,300 (1,505–3,094)	2,696,298	2,573 (1,826–3,320)			

GFP, general and family practice; MSA, metropolitan statistical area.

\*Figure does not meet standard for reliability or precision.

<sup>a</sup>Rate per 100,000 based on 1992, 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

**Table 16. Physician office visits by adult females with urinary tract infection listed as any reason for visit, count, rate<sup>a</sup> (95% CI)**

	Count		Rate		Count	Rate	
	1992		1994			1996	
Total	7,302,802	7,563 (6,307–8,819)	6,505,167	6,752 (5,757–7,747)	6,295,860	6,272 (5,276–7,268)	
Age							
18–34	2,564,452	7,610 (5,280–9,941)	1,800,179	5,466 (3,963–6,970)	1,737,586	5,275 (3,765–6,786)	
35–64	2,775,830	6,159 (4,523–7,795)	2,591,923	5,662 (4,286–7,037)	2,509,412	5,117 (3,817–6,417)	
65+	1,962,520	11,030 (7,900–14,161)	2,113,065	11,984 (8,999–14,969)	2,048,862	11,135 (7,941–14,329)	
Region							
Midwest	1,462,687	6,341 (4,114–8,567)	1,264,608	5,507 (3,746–7,269)	1,562,287	6,644 (4,413–8,876)	
Northeast	1,232,828	6,101 (3,698–8,503)	1,247,926	6,155 (3,936–8,373)	939,584	4,673 (2,873–6,473)	
South	2,909,465	8,708 (6,485–10,931)	2,357,740	7,193 (5,516–8,869)	2,301,628	6,455 (4,806–8,104)	
West	1,697,822	8,545 (5,284–11,805)	1,634,893	8,044 (5,583–10,504)	1,492,361	7,071 (4,715–9,427)	
MSA							
MSA	5,010,454	6,958 (5,651–8,266)	5,526,106	7,659 (6,438–8,880)	4,828,440	6,205 (5,086–7,325)	
Non-MSA	2,292,348	9,337 (6,223–12,451)	979,061	4,047 (2,488–5,607)	1,467,420	6,502 (4,329–8,675)	
Specialty							
Urology	1,280,128	1,326 (1,104–1,547)	849,076	881 (731–1,031)	895,705	892 (696–1,089)	
GFP	3,022,128	3,130 (2,185–4,075)	2,840,667	2,948 (2,210–3,686)	2,629,808	2,620 (1,915–3,324)	
Intern. Med.	1,208,039	1,251 (720–1,782)	1,442,635	1,497 (986–2,009)	1,344,616	1,340 (842–1,837)	
All other	1,792,507	1,856 (1,286–2,427)	1,372,789	1,425 (1,046–1,804)	1,425,731	1,420 (981–1,859)	
		<b>1998</b>		<b>2000</b>			
Total	7,645,826	7,473 (6,146–8,800)	8,150,279	7,778 (6,464–9,093)			
Age							
18–34	2,025,391	6,263 (4,184–8,342)	1,875,092	5,784 (3,776–7,792)			
35–64	3,431,071	6,673 (4,874–8,472)	3,693,141	6,887 (5,146–8,628)			
65+	2,189,364	11,798 (7,849–15,747)	2,582,046	13,780 (9,635–17,925)			
Region							
Midwest	1,689,897	7,111 (4,244–9,979)	1,572,822	6,601 (4,145–9,057)			
Northeast	*	*	1,615,468	7,826 (4,949–10,702)			
South	3,401,109	9,371 (6,980–11,762)	2,486,626	6,699 (4,670–8,728)			
West	1,812,256	8,241 (5,090–11,391)	2,475,363	10,674 (7,242–14,106)			
MSA							
MSA	6,001,991	7,563 (6,033–9,092)	6,242,476	7,638 (6,116–9,113)			
Non-MSA	1,643,835	7,162 (4,509–9,816)	1,907,803	8,275 (5,380–11,170)			
Specialty							
Urology	704,268	688 (498–879)	1,077,581	1,028 (785–1,272)			
GFP	3,377,733	3,301 (2,396–4,207)	3,569,977	3,407 (2,437–4,377)			
Intern. Med.	2,335,343	2,283 (1,494–3,071)	1,914,448	1,827 (1,171–2,483)			
All other	*	*	1,588,273	1,516 (1,001–2,031)			

GFP, general and family practice; MSA, metropolitan statistical area.

\*Figure does not meet standard for reliability or precision.

<sup>a</sup>Rate per 100,000 based on 1992, 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

**Table 17. Physician office visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI)**

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total <sup>c</sup>	1,568,800	7,918 (7,907–7,930)	1,740,660	8,625 (8,613–8,638)	1,585,360	8,319 (8,307–8,332)
Total < 65	102,780	4,303 (4,277–4,329)	145,780	5,425 (5,398–5,453)	144,520	5,204 (5,177–5,230)
Total 65+	1,466,020	8,414 (8,401–8,427)	1,594,880	9,117 (9,103–9,130)	1,440,840	8,851 (8,837–8,865)
Age						
65–74	720,880	7,843 (7,826–7,861)	767,800	8,530 (8,512–8,548)	641,100	8,113 (8,094–8,132)
75–84	571,020	9,681 (9,657–9,705)	619,480	10,348 (10,324–10,373)	599,440	10,261 (10,236–10,285)
85–94	165,460	7,970 (7,933–8,007)	197,260	8,871 (8,834–8,909)	189,900	8,536 (8,499–8,573)
95+	8,660	3,359 (3,289–3,428)	10,340	3,652 (3,582–3,721)	10,400	3,352 (3,288–3,415)
Race/ethnicity						
White	1,403,820	8,363 (8,350–8,377)	1,555,680	8,965 (8,952–8,979)	1,403,340	8,674 (8,660–8,688)
Black	95,360	5,655 (5,621–5,690)	102,840	5,590 (5,557–5,624)	91,440	5,183 (5,150–5,216)
Asian	...	...	8,480	8,983 (8,801–9,165)	12,740	7,200 (7,080–7,321)
Hispanic	...	...	26,300	13,090 (12,942–13,237)	42,340	11,520 (11,417–11,623)
N. American Native	...	...	1,080	6,683 (6,300–7,067)	1,400	5,368 (5,096–5,640)
Region						
Midwest	364,120	7,255 (7,232–7,278)	394,540	7,652 (7,629–7,675)	358,200	7,261 (7,238–7,284)
Northeast	250,720	5,532 (5,511–5,553)	270,300	6,015 (5,993–6,037)	244,060	6,230 (6,206–6,253)
South	710,660	10,170 (10,148–10,193)	782,420	10,829 (10,807–10,852)	717,800	10,229 (10,206–10,251)
West	218,240	7,654 (7,623–7,685)	257,100	8,979 (8,946–9,012)	228,500	8,407 (8,374–8,440)

... data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

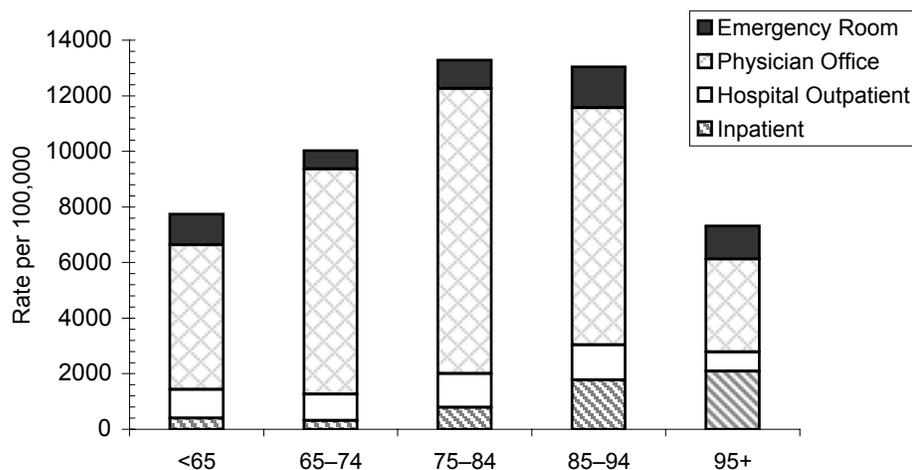
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

increasing acutely in non-MSA, or rural, settings. This may reflect increased availability of hospital-based outpatient services in nonmetropolitan areas.

An analysis of Medicare data for the years 1992, 1995, and 1998 also reflects the trend toward increased hospital outpatient utilization for the management of female UTIs (Table 14). The overall utilization rate across all ages was 395 per 100,000 (95% CI, 392–397) in 1992. It rose to 780 per 100,000 (95% CI, 776–784) in 1995, and to 1,072 per 100,000 (95% CI, 1,068–1,077) in 1998. These trends were similar when stratified by age (< 65 or ≥ 65 years). Very elderly women (≥ 95 years) had the smallest overall increase in hospital outpatient utilization, which corresponds to the larger increase in inpatient hospitalization previously described for this age group.

### Physician Office Care

The outpatient physician office is the most widely utilized site of service for the treatment of female UTIs (Figure 3). According to data from the National Ambulatory Medical Care Survey (NAMCS), there were more than 6,300,000 physician office visits for a primary diagnosis of female UTI in the United States in 2000 (Table 15). The rates of utilization have remained relatively stable for all patients when UTI is among any of the reasons listed for the visit (Table 16), but they increased between 1996 and 2000 when UTI was the primary diagnosis (Table 15). These increases in physician outpatient services occurred in the 35 to 64 and ≥ 65 year old age groups, but not in 18- to 34-year-old groups. Regional variations were observed during the years analyzed, with a generally higher



**Figure 4.** Distribution of urinary tract infection by site of visit, by age, 1998.

SOURCE: Centers for Medicare and Medicaid Services, 1998.

rate of physician office visits for UTI in the South and the West.

When physician outpatient services are stratified by provider specialty, some interesting trends emerge. The overall rates of visits to urologists are consistently lower than those for visits to family practitioners and general practitioners. This indicates that the majority of women with UTI are being treated by their primary care providers. The patients seen by urologists may be those with more complex or severe infections, recurrent UTI, acute pyelonephritis, or other concomitant urologic diagnoses. There was a larger growth in physician office visits for a primary diagnosis of UTI in nonmetropolitan service areas than in metropolitan areas. The significance of this is unclear, but the trend may reflect increased access to providers in less urban areas.

An analysis of CMS data for outpatient physician office visits for the treatment of UTI in women reveals a general increase in utilization between 1992 and 1995, which remained relatively stable in 1998 (Table 17). The most striking observation in this analysis is the peak in utilization among women between 75 and 84 years of age (Figure 4). Rates of utilization in this age group have been consistently higher than those in either older or younger patient populations. The reason for the spike in this age group is not immediately

apparent. Most studies demonstrate a continued increase in the overall incidence and prevalence of UTI with increasing age. However, this likely represents the segment of the community-dwelling 75- to 84-year-old population who are treated as outpatients. Patients in the oldest age groups may be more likely to require inpatient treatment, but this accounts for only part of their lower rates of ambulatory care visits for which UTI is listed as the primary diagnosis (Tables 8–11). Outpatient visits by elderly women are likely to be for multiple conditions, any of which may be listed as the primary diagnosis.

An additional observation is the sizable geographic disparity between the South and other regions in the rate of physician office visits for UTI among female Medicare beneficiaries. Although this trend has been observed in some of the other analyses, it is most pronounced in this comparison. This difference appears to have been stable between 1992 and 1998. The reason for the sharply greater utilization in the South is unclear but may be associated with a higher prevalence of UTI in this region.

#### *Ambulatory Surgery Care*

Some women with UTIs may be treated in the ambulatory surgery setting. Data from Medicare beneficiaries treated for a diagnosis of UTI in

**Table 18. Visits to ambulatory surgery centers by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI)**

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total <sup>c</sup>	21,420	108 (107–110)	20,080	100 (98–101)	18,240	96 (94–97)
Total < 65	1,540	64 (61–68)	2,040	76 (73–79)	2,040	73 (70–77)
Total 65+	19,880	114 (113–116)	18,040	103 (102–105)	16,200	100 (98–101)
Age						
65–74	10,920	119 (117–121)	9,620	107 (105–109)	8,020	101 (99–104)
75–84	7,120	121 (118–124)	6,440	108 (105–110)	6,540	112 (109–115)
85–94	1,700	82 (78–86)	1,880	85 (81–88)	1,580	71 (68–75)
95+	140	54 (45–63)	100	35 (28–42)	60	19 (15–24)
Race/ethnicity						
White	18,860	112 (111–114)	17,820	103 (101–104)	16,080	99 (98–101)
Black	1,480	88 (83–92)	1,580	86 (82–90)	1,400	79 (75–83)
Asian	...	...	...	...	...	...
Hispanic	...	...	180	90 (77–103)	320	87 (78–97)
N. American Native	...	...	0	0	20	77 (42–111)
Region						
Midwest	7,300	145 (142–149)	6,260	121 (118–124)	6,140	124 (121–128)
Northeast	4,600	101 (99–104)	4,020	89 (87–92)	3,900	100 (96–103)
South	7,880	113 (110–115)	8,780	122 (119–124)	6,700	95 (93–98)
West	1,640	58 (55–60)	980	34 (32–36)	1,480	54 (52–57)

... data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

ambulatory surgery centers (Table 18) revealed that the overall rate of utilization of this service site for a primary diagnosis of UTI was quite low, ranging from 108 cases per 100,000 (95% CI, 107–110) in 1992 to 96 cases per 100,000 (95% CI, 94–97) in 1998 (Figure 2). This most likely reflects the fact that UTI is not generally a primary surgical diagnosis. Many of these patients may have been scheduled for other operations and were subsequently found to have a UTI at the time of their presentation for surgery or were identified as having a UTI at the time of their pre- or post-operative visit. Utilization rates were generally low regardless of age, geographic region, or patient race/ethnicity. These data indicate that ambulatory surgery centers are not significant service sites for the treatment of UTI in women.

### Emergency Room Care

The emergency room (ER) represents a significant site of care for many women with a primary diagnosis of UTI. According to NHAMCS data, approximately 1.3 million ER visits were made by women in the United States for evaluation and treatment of UTI in 2000 (Table 19). This represents a utilization rate of 1,252 visits per 100,000 adult women (95% CI, 1,077–1,426). Rates of use were highest for women 18 to 34 years of age (Figure 3). This trend was apparent in almost all the years analyzed (1994–2000). Utilization rates for young women ranged from 2.5 to 3.6 times those for 35- to 64-year-old women. Women 65 and over had higher utilization rates, but they were still lower than those of the youngest stratum. There was a slight decrease in the rate of ER utilization in all age groups between 1994 and 1998; however, the rates increased again for all patients in 2000.

Table 19. Emergency room visits by adult females with urinary tract infection listed as primary diagnosis, count, rate<sup>a</sup> (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total <sup>b</sup>	1,205,099	1,251 (1,086–1,415)	1,114,941	1,111 (951–1,270)	1,106,420	1,081 (916–1,247)	1,311,359	1,252 (1,077–1,426)
Age								
18–34	679,567	2,064 (1,697–2,430)	557,447	1,692 (1,351–2,034)	498,278	1,541 (1,192–1,890)	665,796	2,054 (1,655–2,452)
35–64	262,839	574 (430–718)	317,112	647 (473–820)	316,118	615 (425–804)	362,324	676 (502–849)
65+	262,693	1,490 (1,049–1,931)	240,382	1,306 (893–1,719)	292,024	1,574 (1,143–2,004)	283,239	1,512 (1,038–1,985)
Race/ethnicity								
White	817,265	1,117 (932–1,301)	732,145	974 (795–1,153)	772,815	1,022 (831–1,213)	879,708	1,152 (951–1,354)
Black	244,538	2,121 (1,531–2,711)	264,662	2,195 (1,576–2,815)	239,602	1,923 (1,304–2,542)	322,515	2,501 (1,833–3,170)
Region								
Midwest	265,481	1,156 (826–1,487)	241,660	1,028 (688–1,367)	277,562	1,168 (770–1,566)	410,628	1,723 (1,284–2,162)
Northeast	309,787	1,528 (1,113–1,943)	254,887	1,268 (927–1,608)	208,294	1,028 (756–1,300)	150,389	729 (500–957)
South	451,722	1,378 (1,088–1,668)	451,731	1,267 (963–1,571)	476,927	1,314 (991–1,637)	535,863	1,444 (1,112–1,775)
West	178,109	876 (597–1,156)	166,663	790 (535–1,044)	143,637	653 (409–897)	214,479	925 (622–1,228)
MSA								
MSA	950,511	1,317 (1,127–1,507)	758,101	974 (817–1,132)	779,686	982 (809–1,156)	968,197	1,185 (1,003–1,367)
Non-MSA	254,588	1,052 (724–1,381)	356,840	1,581 (1,124–2,038)	326,734	1,424 (995–1,852)	343,162	1,488 (1,030–1,947)

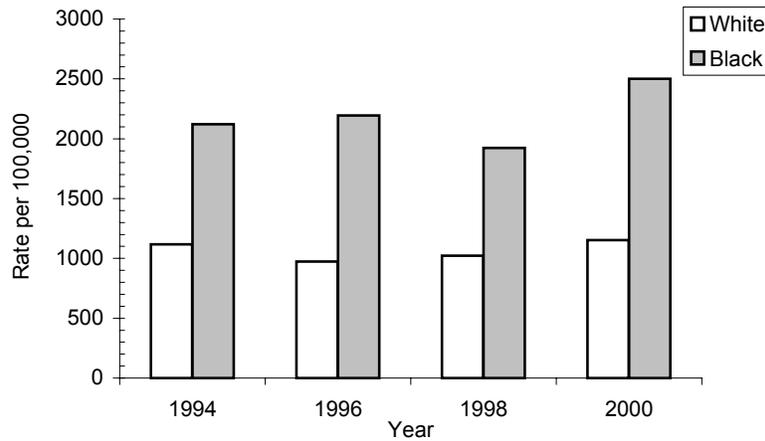
MSA, metropolitan statistical area.

<sup>a</sup>Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

<sup>b</sup>Persons of other races are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

Source: National Hospital Ambulatory Medical Care Survey — ER, 1994, 1996, 1998, 2000.



**Figure 5. Rate of emergency room visits by females with urinary tract infection listed as primary diagnosis, by patient race and year.**

SOURCE: Healthcare Cost and Utilization Project, 1994, 1996, 1998, 2000.

**Table 20. Emergency room visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI)**

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total <sup>c</sup>	157,180	793 (789–797)	177,700	881 (876–885)	177,780	933 (929–937)
Total < 65	21,620	905 (893–917)	28,180	1,049 (1,037–1,061)	30,840	1,110 (1,098–1,123)
Total 65+	135,560	778 (774–782)	149,520	855 (850–859)	146,940	903 (898–907)
Age						
65–74	53,720	584 (580–589)	56,500	628 (623–633)	51,080	646 (641–652)
75–84	53,300	904 (896–911)	56,760	948 (940–956)	59,480	1,018 (1,010–1,026)
85–94	25,640	1,235 (1,220–1,250)	32,120	1,445 (1,429–1,460)	32,680	1,469 (1,453–1,485)
95+	2,900	1,125 (1,084–1,165)	4,140	1,462 (1,418–1,506)	3,700	1,192 (1,154–1,231)
Race/ethnicity						
White	125,180	746 (742–750)	141,780	817 (813–821)	141,220	873 (868–877)
Black	22,640	1,343 (1,325–1,360)	27,380	1,488 (1,471–1,506)	26,340	1,493 (1,475–1,511)
Asian	...	...	600	636 (585–686)	740	418 (388–448)
Hispanic	...	...	2,720	1,354 (1,303–1,405)	4,880	1,328 (1,291–1,365)
N. American Native	...	...	340	2,104 (1,881–2,327)	400	1,534 (1,384–1,683)
Region						
Midwest	35,540	708 (701–715)	42,220	819 (811–827)	43,360	879 (871–887)
Northeast	27,300	602 (595–609)	29,660	660 (653–668)	26,860	686 (677–694)
South	73,280	1,049 (1,041–1,056)	83,120	1,150 (1,143–1,158)	84,300	1,201 (1,193–1,209)
West	19,380	680 (670–689)	20,780	726 (716–736)	21,000	773 (762–783)

... data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

**Table 21. Female nursing home residents with an admitting or current diagnosis of urinary tract infection, count, rate<sup>a</sup> (95% CI)**

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Total <sup>b</sup>	104,100	9,252 (8,489–10,015)	95,302	8,243 (7,514–8,972)	83,208	7,111 (6,423–7,800)
Age						
18–74	13,280	7,800 (5,883–9,717)	17,136	9,492 (7,518–11,465)	10,454	5,529 (4,042–7,015)
75–84	35,213	9,580 (8,223–10,938)	30,158	8,109 (6,829–9,388)	24,555	6,671 (5,494–7,848)
85+	55,607	9,467 (8,415–10,520)	48,008	7,953 (6,962–8,943)	48,200	7,864 (6,857–8,872)
Race/ethnicity						
White	93,253	9,330 (8,515–10,144)	84,602	8,379 (7,591–9,166)	71,181	7,125 (6,375–7,874)
Other	10,847	8,820 (6,604–11,036)	10,700	7,752 (5,735–9,770)	11,793	7,230 (5,435–9,024)

<sup>a</sup>Rate per 100,000 nursing home residents in the same demographic stratum.

<sup>b</sup>Persons of unspecified race are included in the totals.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Race/ethnicity appears to be an important factor in the ER utilization rates for treatment of UTI in women. The age-unadjusted rate of ER use by African American women was approximately twice that for Caucasians or other ethnic groups in all the years analyzed (Figure 5). This may reflect the general propensity toward increased ER utilization among African Americans for most clinical problems. Less regional variation was observed, although the overall rates of ER use among nonmetropolitan areas were higher than those in urban areas.

Analysis of Medicare data for ER use reveals similar trends (Table 20). Overall ER visits for female Medicare patients with UTI increased gradually between 1992 and 1998. When patients are stratified by age, little variation in utilization rates is seen over this time period. However, women over age 85 had a consistently higher rate of ER use than did younger women. The rate of ER use for Medicare beneficiaries was higher in the South than in other regions of the country. Caucasian women had lower rates of ER utilization than did other ethnic groups.

The notably higher overall rates of ER use by young women with UTI may reflect the relative lack of insurance in this segment of the population. These women may use the ER because they lack resources or have not identified a primary care provider. This pattern of utilization unnecessarily drives up the overall cost of healthcare.

### Nursing Home Care

Data from the National Nursing Home Survey (NNHS) indicate that UTI as either an admitting or current diagnosis among female nursing home residents declined from 9,252 per 100,000 in 1995 to 7,111 per 100,000 in 1999 (Table 21). No clear association with age was observed over this time period. The decline in the identification of asymptomatic UTI in this population may result from the fact that screening for bacteriuria in nursing home residents is no longer widely practiced. Nursing home residents with UTI had higher rates of urinary incontinence than did women in the general nursing home population (Tables 22 and 23). As expected, the proportion of women with indwelling foley catheters or ostomies nearly double in women with UTI than it was in the female nursing home population in general.

Overall trends in nursing home patients indicate that 56 to 58% of female residents have problems with urinary incontinence (Table 23). At least half of these residents also require some form of assistance to use the toilet, usually from another person. The overall rate of indwelling catheter use in nursing homes appears low (7.9% to 9.1%), according to these data. This reflects a widespread trend toward minimizing the use of indwelling catheters in nursing home residents to help minimize the risk of UTI.

Table 22. Special needs of female nursing home residents with urinary tract infection, count, rate<sup>a</sup> (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Has indwelling foley catheter or ostomy						
Yes	17,818	17,116 (13,818–20,415)	13,302	13,958 (10,735–17,180)	14,210	17,077 (13,211–20,943)
No	85,707	82,331 (78,993–85,669)	81,772	85,803 (82,556–89,050)	68,998	82,923 (79,057–86,789)
Question left blank	575	553 (0–1,183)	228	240 (0–711)	0	0
Requires assistance using the toilet						
Yes	62,124	59,677 (55,411–63,943)	57,710	60,555 (56,034–65,076)	42,226	50,748 (45,705–55,791)
No	16,430	15,783 (12,601–18,966)	13,238	13,890 (10,729–17,052)	14,070	16,909 (13,018–20,800)
Question skipped for allowed reason	25,329	24,331 (20,585–28,078)	23,883	25,060 (21,041–29,079)	26,212	31,501 (26,771–36,231)
Question left blank	217	208 (0–617)	471	495 (0–1,181)	700	842 (0–1,716)
Requires assistance from equipment when using the toilet						
Yes	17,219	16,541 (13,311–19,770)	15,682	16,456 (13,032–19,879)	15,008	18,037 (14,290–21,784)
No	43,542	41,827 (37,564–46,089)	40,082	42,058 (37,479–46,637)	25,973	31,215 (26,578–35,852)
Question skipped for allowed reason	41,759	40,114 (35,852–44,377)	37,121	38,951 (34,441–43,460)	40,281	48,410 (43,365–53,456)
Question left blank	1,580	1,518 (465–2,571)	2,417	2,536 (1,093–3,979)	1,945	2,338 (865–3,810)
Requires assistance from another person when using the toilet						
Yes	62,124	59,677 (55,411–63,943)	57,119	59,935 (55,403–64,468)	42,695	51,311 (46,267–56,356)
No	0	0	214	225 (0–667)	156	188 (0–557)
Question skipped for allowed reason	41,759	40,114 (35,852–44,377)	37,121	38,951 (34,441–43,460)	40,281	48,410 (43,365–53,456)
Question left blank	217	208 (0–617)	847	889 (12–1,767)	76	91 (0–269)
Has difficulty controlling urine						
Yes	65,954	63,356 (59,162–67,550)	62,266	65,336 (60,922–69,749)	54,497	65,495 (60,622–70,369)
No	25,656	24,645 (20,917–28,373)	24,155	25,345 (21,327–29,363)	19,204	23,079 (18,709–27,450)
Question skipped for allowed reason	11,767	11,303 (8,485–14,121)	8,484	8,903 (6,208–11,597)	9,354	11,242 (7,983–14,501)
Question left blank	724	696 (0–1,501)	397	416 (0–996)	153	184 (0–546)

<sup>a</sup>Rate per 100,000 adult female nursing home residents with urinary tract infection in the NNHS for that year.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 23. Special needs of female nursing home residents regardless of urinary tract infection diagnosis, count, rate<sup>a</sup> (95% CI)

	1995			1997			1999		
	Count	Rate		Count	Rate		Count	Rate	
Has indwelling foley catheter or ostomy									
Yes	101,827	9,050 (8,281–9,819)		90,855	7,859 (7,151–8,566)		96,151	8,218 (7,484–8,951)	
No	1,020,886	90,732 (89,954–91,510)		1,061,282	91,796 (91,072–92,520)		1,064,024	90,937 (90,162–91,712)	
Question left blank	2,450	218 (89–347)		3,997	346 (182–510)		9,890	845 (571–1,120)	
Requires assistance using the toilet									
Yes	659,035	58,572 (57,256–59,888)		652,615	56,448 (55,131–57,765)		670,006	57,262 (55,935–58,590)	
No	286,946	25,503 (24,334–26,671)		280,242	24,240 (23,104–25,375)		273,104	23,341 (22,202–24,480)	
Question skipped for allowed reason	173,839	15,450 (14,484–16,417)		216,408	18,718 (17,680–19,756)		218,971	18,714 (17,670–19,759)	
Question left blank	5,343	475 (297–652)		6,870	594 (394–794)		7,983	682 (430–935)	
Requires assistance from equipment when using the toilet									
Yes	182,812	16,248 (15,274–17,221)		180,518	15,614 (14,659–16,569)		178,305	15,239 (14,293–16,185)	
No	460,230	40,903 (39,592–42,215)		433,640	37,508 (36,220–38,795)		467,351	39,942 (38,631–41,254)	
Question skipped for allowed reason	460,785	40,953 (39,639–42,267)		496,649	42,958 (41,643–44,272)		492,075	42,055 (40,732–43,379)	
Question left blank	21,336	1,896 (1,536–2,257)		45,327	3,921 (3,391–4,450)		32,334	2,763 (2,303–3,224)	
Requires assistance from another person when using the toilet									
Yes	652,088	57,955 (56,636–59,274)		640,137	55,369 (54,048–56,689)		661,927	56,572 (55,242–57,901)	
No	6,109	543 (345–741)		8,603	744 (511–977)		6,800	581 (384–779)	
Question skipped for allowed reason	460,785	40,953 (39,639–42,267)		496,649	42,958 (41,643–44,272)		492,075	42,055 (40,732–43,379)	
Question left blank	6,180	549 (357–741)		10,745	929 (681–1,178)		9,263	792 (527–1,056)	
Has difficulty controlling urine									
Yes	633,123	56,269 (54,943–57,596)		672,699	58,185 (56,875–59,496)		685,747	58,608 (57,288–59,927)	
No	424,287	37,709 (36,411–39,006)		422,839	36,574 (35,293–37,854)		422,162	36,080 (34,793–37,367)	
Question skipped for allowed reason	64,822	5,761 (5,124–6,398)		57,080	4,937 (4,370–5,504)		55,713	4,761 (4,201–5,322)	
Question left blank	2,931	260 (114–407)		3,517	304 (154–454)		6,444	551 (323–778)	

<sup>a</sup>Rate per 100,000 adult female nursing home residents in the NNHS for that year.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

**Table 24. Expenditures for female Medicare beneficiaries for treatment of urinary tract infection by site of service, 1998**

Service Type	Total Annual Expenditures	
	Age < 65	Age 65+
Inpatient	\$71,600,000	\$687,600,000
Outpatient		
Physician Office	\$17,200,000	\$171,000,000
Hospital Outpatient	\$2,900,000	\$15,500,000
Ambulatory Surgery	\$3,400,000	\$24,000,000
Emergency Room	\$9,800,000	\$58,400,000
<b>Total</b>	<b>\$104,900,000</b>	<b>\$956,500,000</b>

SOURCE: Centers for Medicare and Medicaid Services, 1998.

**ECONOMIC IMPACT**

The economic burden of UTIs in adult women is significant. A substantial number of inpatient hospitalizations, outpatient hospital and clinic visits, and ER visits for the diagnosis and management of

female UTI occur each year. The associated direct and indirect costs are also large and include substantial out-of-pocket expenses for the patients. Composite data suggest that the overall expenditures for treatment of UTIs among women in the United States were approximately \$2.47 billion in 2000, excluding spending on outpatient prescription drugs (Table 7). Inpatient services accounted for the majority of treatment costs, although the fraction of expenditures devoted to inpatient care declined over time. Total spending on UTIs for women, after adjustment for inflation, increased about 1% per year between 1994 and 2000. The biggest percentage increases in spending were for services provided in physician offices and ERs. Most of the UTI-related expenditures in Medicare beneficiaries were for inpatient services (Table 24). The bulk of this spending was for women over 65, although UTI-related expenditures exceeded \$100 million in 1998 among Medicare enrollees under 65, primarily the disabled. This does not include expenditures for complementary and alternative

**Table 25. Estimated annual expenditures of privately insured employees with and without a medical claim for a urinary tract infection in 1999<sup>a</sup>**

	Annual Expenditures (per person)			
	Persons without UTI (N=267,520)	Persons with UTI (N=11,430)		
		Total	Total	Medical
Total	\$3,099	\$5,470	\$4,414	\$1,056
Age				
18–34	\$2,685	\$5,067	\$4,333	\$734
35–44	\$2,861	\$5,327	\$4,398	\$929
45–54	\$3,173	\$5,752	\$4,565	\$1,187
55–64	\$3,279	\$5,515	\$4,342	\$1,173
Gender				
Male	\$2,715	\$5,544	\$4,528	\$1,016
Female	\$3,833	\$5,407	\$4,325	\$1,082
Region				
Midwest	\$2,988	\$5,423	\$4,367	\$1,057
Northeast	\$2,981	\$5,197	\$4,157	\$1,040
South	\$3,310	\$5,838	\$4,757	\$1,080
West	\$3,137	\$5,762	\$4,716	\$1,046

Rx, prescription.

<sup>a</sup>The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled in 1999. Estimated annual expenditures were derived from multivariate models that control for age, gender, work status (active/retired), median household income (based on zip code), urban/rural residence, medical and drug plan characteristics (managed care, deductible, co-insurance/co-payments), and 26 disease conditions.

SOURCE: Ingenix, 1999.

**Table 26. Average annual spending and use of outpatient prescription drugs for treatment of urinary tract infection (male and female), 1996–1998<sup>a</sup>**

Drug Name	Number of Rx Claims	Mean Price	Total Expenditures
Cipro™	774,067	\$60.27	\$46,652,998
Macrobid™	477,050	\$26.80	\$12,784,949
Triple antibiotic	329,253	\$8.44	\$2,778,898
Floxin™	279,564	\$54.10	\$15,124,394
Phenazopyridine	245,275	\$5.50	\$1,349,013
Amoxicillin	183,244	\$8.46	\$1,550,247
TMP/SMX	162,216	\$6.23	\$1,010,606
Bactrim	145,898	\$13.62	\$1,987,126
Nitrofurantoin	137,353	\$38.22	\$5,249,632
TMP-SMX ds	129,853	\$5.48	\$711,594
Oxybutynin	123,631	\$28.87	\$3,569,227
Cephalexin	118,985	\$19.06	\$2,267,854
Sulfacetamide	103,917	\$6.17	\$641,168
Sulfisoxazole	96,253	\$7.82	\$752,701
Total	3,306,559		\$96,430,407

Rx, prescription.

<sup>a</sup>Estimates include prescription drug claims with a corresponding diagnosis for urinary tract infection (both males and females) and exclude drug claims for which there was insufficient data to produce reliable estimates. Including expenditures on these excluded medications would increase total outpatient drug spending for urinary tract infections by approximately 52%, to \$146 million.

SOURCE: Medical Expenditure Panel Survey, 1996–1998.

**Table 27. Annual cost of female urinary tract infection, 1995**

	Cost
Direct costs	
Medical expenses	
Clinic charges	\$385,000,000
Prescriptions	\$89,000,000
Nonmedical expenses	
Travel and childcare for visits	\$77,000,000
Output lost due to time spent for visits	\$108,000,000
Total direct costs	\$659,000,000
Indirect costs	
Output lost due to disability	
During bed days	\$300,000,000
During other days of restricted activity	\$300,000,000
During other days with symptoms	\$336,000,000
Total indirect costs	\$936,000,000
Total costs	\$1,594,000,000

SOURCE: Reprinted from *Annals of Epidemiology*, 10, Foxman B, Barlow R, D'Arcy, H, Gillespie B, Sobel JD, Urinary tract infection: self-reported incidence and associated costs, 509–515, Copyright 2000, with permission from Elsevier Science.

therapies, which may be substantial, given widespread beliefs in such remedies as cranberry juice (7).

The mean annual healthcare expenditures for privately insured women with a diagnosis of UTI in 1999 were approximately 1.4 times higher than those for women without UTI (\$5,407 vs \$3,833) (Table 25). Although similar across regions, the estimated overall costs in the South were the highest in the United States. Patient age did not appear to be a significant factor in healthcare expenditures in 1999.

An analysis of prescribing costs reflects a propensity to prescribe expensive medications such as the fluoroquinolones disproportionately, rather than TMP-SMX or other less expensive agents (Table 26). The average cost for a course of a fluoroquinolone is more than six times that for a course of TMP-SMX. This finding is consistent with the well-documented increases in healthcare costs driven by prescription drug utilization. This is also of concern because of the increased risk of drug resistance. Conversely, fluoroquinolone use may be warranted in areas where bacterial resistance to less-expensive agents already exceeds 20% of cases. These data do not reflect the success of treatment or whether prescriptions were based on culture and susceptibility results. Nor does this analysis account for any subsequent savings that may occur incident to the use of fluoroquinolones. Use of the basic therapeutic guidelines discussed earlier might alleviate some of these risks and costs. The estimated direct costs for female UTI are substantially lower in other studies (Table 27).

In addition to the direct medical costs of treatment, UTIs can affect labor market factors such as absenteeism and work limitations (Tables 28 and 29). Although cystitis is more common among women, pyelonephritis is associated with the greatest burden of work loss. Data from Medstat's 1999 Health and Productivity Management survey suggest that 24% of women with a medical claim for pyelonephritis missed some work time related to treatment of the condition, the average being 7.7 hours lost per year.

## SPECIAL CONSIDERATIONS

HCUP data on women hospitalized for UTI suggest that diabetes may be a risk factor for the development of infection (Table 30). This may be due to changes in voiding physiology in diabetic patients

**Table 28. Average annual work loss of persons treated for urinary tract infection (95% CI)**

Condition	Number of Persons <sup>a</sup>	% Missing Work	Average Work Absence (hrs)		
			Inpatient	Outpatient	Total
Cystitis					
Males	116	18%	0.1 (0–0.4)	10.3 (0–24.5)	10.5 (0–24.7)
Females	426	16%	0	4.8 (3.0–6.6)	4.8 (3.0–6.6)
Pyelonephritis					
Males	71	21%	1.6 (0–4.7)	9.4 (2.6–16.2)	11.0 (3.6–18.4)
Females	79	24%	2.1 (0–4.2)	5.6 (2.0–9.1)	7.7 (3.7–11.7)
Other UTIs					
Males	779	15%	0.9 (0–2.6)	5.5 (3.7–7.3)	6.5 (4.0–8.9)
Females	1,846	17%	0	7.4 (5.5–9.3)	7.5 (5.6–9.3)
Orchitis	398	14%	1.5 (0.7–3.7)	6.1 (1.3–10.9)	7.6 (2.3–12.9)

<sup>a</sup>Individuals with an inpatient or outpatient claim for a urinary tract infection and for whom absence data were collected. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit. SOURCE: MarketScan, 1999.

that lead to an increase in urinary retention, which in turn provides a nidus for infection. In addition, there may be alterations in the overall immune status of diabetic patients that predispose them to UTI. Assuming a prevalence of diabetes in the 40- to 70-year-old general population of 12.9% (8), the observed UTI rate of approximately 26% (63,662 per 245,879 in 2000) in this population suggests a relationship between the two disorders. Other data from the National Health Interview Survey also support this observation (9). However, the role of diabetes in the risk of UTI development remains controversial, and additional research is needed to clarify the associations.

## CONCLUSIONS

Urinary tract infection remains one of the most common urologic diseases of women in the United States. The overall lifetime risk of developing a UTI is high (> 50% of all adult women), and appropriate diagnosis and treatment are essential to quality care. This analysis has revealed several interesting trends. There appears to have been some decrease in the use of inpatient hospitalization for the treatment of UTI in younger women, although it is still a significant source of healthcare expenditures for elderly women with this diagnosis. There has been an overall trend toward increased use of outpatient care in a variety of settings for acute pyelonephritis and selected cases of complicated infections. Analysis of prescribing

patterns reveals great reliance on fluoroquinolones over more traditional first-line antimicrobials. This could have a variety of significant impacts in terms of both cost and biology. Efforts to slow the development of drug-resistant pathogens will depend heavily on future prescribing patterns.

## RECOMMENDATIONS

This analysis raises a number of significant research questions regarding the evaluation and treatment of UTI in women. To what degree should prevention be emphasized in UTI care? What are the best recommendations for prevention? What is the role of the environment in the development of UTI in women, given the general observation that the rates of infection are higher in the South than in other regions?

Economic research related to female UTI will also be important in the future. The costs of caring for women with UTI are high, and methods to reduce costs while maintaining high-quality care are needed. The role of innovative methods for prevention and treatment will be important. For example, self-start therapy, in which a woman keeps a supply of antimicrobials for use when she develops symptoms of a UTI, has been proposed for women with recurrent UTI. Additional studies will be needed to identify

**Table 29. Average work loss associated with a hospitalization or an ambulatory care visit for treatment of urinary tract infection (95% CI)**

Condition	Inpatient Care		Outpatient Care	
	Number of Hospitalizations <sup>a</sup>	Average Work Absence (hrs)	Number of Outpatient Visits	Average Work Absence (hrs)
Cystitis				
Males	*	*	157	7.6 (0–18.1)
Females	*	*	629	3.2 (2.2–4.3)
Pyelonephritis				
Males	*	*	87	7.7 (2.1–13.2)
Females	*	*	105	4.2 (2.0–6.4)
Other UTIs				
Males	*	*	1,047	4.1 (2.8–5.4)
Females	*	*	2,669	5.1 (3.9–6.4)
Orchitis	*	*	633	3.8 (1.2–6.5)

\*Figure does not meet standard for reliability or precision.

<sup>a</sup>Unit of observation is an episode of treatment. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

**Table 30. Diabetes diagnosis as a comorbidity in adult females hospitalized for urinary tract infection, count (% of total), rate<sup>a</sup>**

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	223,256	232	235,055	234	243,584	238	245,879	235
Without diabetes as listed diagnosis	176,150 (79%)	183	179,391 (76%)	179	182,659 (75%)	179	182,217 (74%)	174
With diabetes as listed diagnosis	47,105 (21%)	49	55,663 (24%)	56	60,925 (25%)	60	63,662 (26%)	61

<sup>a</sup>Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

the clinical efficacy and cost-utility of this approach. Additional research is also needed on the debate over definitions of UTI vs pyuria, the role of empirical therapy, and the need for routine urine culture and susceptibility testing, given the current controversies in the field. In addition, issues related to access to care will need to be explored. There has been a sharp rise in ER visits for UTI, particularly among young women. The cause of this utilization pattern needs to be identified and addressed. Answers to these research questions and others will contribute to the continued improvement of healthcare for women with UTI.

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